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THE SCALES OF THE COBITID AND HOMALOPTERID
FISHES.

BY T. D. A. COCKERELL.

According to Boulenger, the Cobitids and Homalopterids form subfamilies (Cobitidinae and Homalopterinae) of the Cyprinidae. Gill, as far back as 1861, proposed to treat both groups as distinct families, Cobitidae and Homalopteridae, a course in which he has been followed by several writers. Having regard for all the characters, it seems that we may recognize a distinct family Cobitidae, but the Homalopterids may be regarded as very aberrant Cobitids. The arrangement will then be as follows (using the characters cited by Gill and Boulenger):

COBITIDÆ. Maxillaries not bordering the mouth, barbels three to six pairs; pharyngeal teeth in one row; air-bladder with a long capsule; scale small or absent.

- (1) *Cobitinae*. Air-bladder variably modified or reduced, but always distinct.
- (2) *Homalopterinae*. Air-bladder rudimentary. Curiously flattened fishes, adapted to life in mountain streams, where they are able to adhere to the rocks in a strong current.

Gyrinochilus Vaillant, regarded by Gill as the type of a family Gyrinochilidae, is certainly very different from these, and has large scales. I regret that I have never seen a specimen.

The scales of the Cobitidae, as here defined, appear to be of a sufficiently uniform type. In the genus *Misgurnus* of the Cobitinae they are relatively large and well developed, and have an exceedingly beautiful pattern. They are fairly large, however, in *Homaloptera*.

- (1) *Misgurnus fossilis*. (River Volga, Astrakan; Moscow Univ., B. Mus.) Scales about 2 mm. diameter, subcircular, rather broader than long; nuclear area very near the base, not granular, with fine radii (averaging about 50μ apart) extending in all directions, the latero-basal ones with a graceful downward curve. About 23 radii start from the vicinity of the nucleus, but as they diverge the intervals are filled by supplementary radii, so that the spacing throughout is fairly uniform. Circuli moderately dense, not differentiated in the apical area.
- (2) *Misgurnus anguillicaudatus*. (Shanghai; *Swinhoe*; B. Mus.) The largest Cobitid scale known to me. Transverse diameter about 3 mm. or a little over; structure as in *M. fossilis*, except that in the apical field there are at intervals much stronger circuli, giving a strongly ribbed or cancellated effect. The scale is considerably broader than long.
- (3) *Cobitis tenuis*. (Goto Is., Japan; *Gordon Smith*; B. Mus.) Scales thin, transversely oval, about 460μ long and 600μ broad; radii all around, but relatively few, about 14 may be considered apical; circuli only moderately dense. A scale of the same general type as that of *Misgurnus*, but much smaller and weaker. Among the Cyprinids proper, it closely resembles that of *Chrosomus*.
- (4) *Cobitis guntea*. (Calcutta; *F. Day*; B. Mus.) Scale very different from that of *C. tenuis*; it is much elongated, oblong, about 1360μ long and 780μ broad, with very distinct and beautiful sculpture of the *Misgurnus* type, but with the circuli in the apical region widely spaced, giving a cancellated effect, many of the spaces formed by the intersection of the circuli and radii diamond-shaped. The circuli are very numerous, and the nuclear area is very near (about 170μ from) the base. This is generically distinct from *C. tenuis*.
- (5) *Cobitis gongota*. (N. E. Bengal; *Jerdon*; B. Mus.) Scales greatly elongated, rounded apically, the base flattened or truncate; length about 1275μ , breadth 630μ ; nucleus about 200μ from base. This is of the same general type as *C. guntea*, but very distinct by the fewer radii and circuli. Thus there are 8 or 9 apical radii (not counting lateral ones) and about 11 or 12 apical circuli; in *C. guntea* there are at least twice as many.
- (6) *Lepidocephalichthys berdmorei*. (NampanDET, Shan States, alt. 2000 ft.; *Oates*; B. Mus.) Scale shaped exactly as in *C. gongota* (length about 1370μ), and with quite the same sort of sculpture. The apical radii are perhaps rather less numerous, but there are more (about 23) apical circuli. The difference is such as might be expected between two closely allied species.

The above are all Cobitinae; the following three are Homalopterinae:

- (7) *Gastromyzon borneensis*. (Senab, Sarawak; *Everett*; B. Mus.) Scale oblong, subquadrate, the base obliquely truncate, more or less

asymmetrical; length of scale about $1190\ \mu$, breadth about $850\ \mu$; sculpture much as in the last two species; basal and apical radii well developed, latter variable and more or less broken; apical about 13, the outer ones curving basally toward the nucleus; circuli widely spaced. Lateral line scales have the radii fewer and the circuli closer. The nucleus is about $290\ \mu$ from base. There is nothing whatever in these scales that affords any radical distinction from the Cobitines, especially *Lepidocephalichthys*.

- (8) *Homaloptera maculata*. (Khassya; Jerdon; B. Mus.) A very curious fish, the under side flat. (By no means so specialized as *Gastromyzon*, however.) Scales fairly large, nearly 2 mm. long, and nearly as broad; apex broadly rounded, base flattened; radii all round, strong, not very close (about 15 apical), very short, owing to the very large nuclear area, over which are scattered spots arising from the breaking up of the central parts of the radii, the width of this nuclear area is about $850\ \mu$; circuli widely spaced. The sculpture here is essentially as in *Gastromyzon*, etc., except for the remarkably modified central region.
- (9) *Homaloptera brucei*. (Meekalan, Tenasserim; Fea; B. Mus.) Scales smaller, about $1275\ \mu$ long, and broader, but of entirely the same pattern. The apical radii are irregular and more or less broken up.

The Cobitinae have their headquarters in the Indian region, where Day recognized nine genera and 46 species. (*Botia*, 6 species; *Acanthopsis*, 1; *Somileptes*, 1; *Lepidocephalichthys*, 3; *Acanthophthalmus*, 1; *Apua*, 1; *Jerdonia*, 1; *Nemachilichthys*, 1; *Nemachilus*, 31.) From Japan, Jordan and Fowler recognized (1903) five genera and six species. The only African genus is *Nemachilus* (*N. abyssinicus* Blgr., Lake Tsana, Abyssinia). *Misgurnus*, *Acanthopsis* and *Cobitis* get as far west as France. Not a single species has reached America. Three species of *Cobitis* occur in the Upper Miocene beds at Oeningen (Wangen), Baden; I have examined specimens of them in the British Museum.

The Homalopterinae, with four genera, are exclusively Asiatic, occurring in China and India, and the Malay Peninsula and Archipelago.

It seems rather remarkable that a group so diverse, and in some of its members so specialized, and therefore probably of great antiquity, should not have spread more widely. No doubt the carnivorous Characiniids may have proved an obstacle in Africa, and it must also be remembered that the past distribution may have been wider than the present. The discovery of a fossil Cobitid in America may not be altogether out of the question.

The scales, all of essentially the same type, are more or less degenerate, but hardly specialized. They appear to represent the earlier type of Cyprinoid scale in a weak form, and that is why they remind one of certain scales of various genera of true Cyprinidae.